

Meteors were also observed during the month on the following dates:

1st, Orono, Me. 3d, Starkey, N. Y. 5th, Pekin, Ill.; Orono, Me.; Weldon, N. C. 7th, Cedar Keys, Fla.; Wauseon, Ohio. 8th, Cedar Keys, Fla.; Woodstock, Md. 9th, Fort Sully, Dak.; Trenton, Tenn. 12th, Manatee, Fla.; Harvard, Nebr. 13th, Woodstock, Md.; Kalamazoo, Thornville, and Benzonia, Mich.; Jacksonborough, Ohio; Tatoosh Island, Wash.; Mount Angel, Oregon; Riddleton, Tenn. 14th, Fort Sully, Dak.; Manatee, Fla.; Starkey, N. Y.; Delavan, Wis. 15th, Bar Harbor, Gardiner, and Eastport, Me.; North Truro, Mass. 16th, Yuma, Ariz. 17th, Taunton, Mass.; Kalamazoo, Mich.; Beverly and Egg Harbor City, N. J.; Factoryville, N. Y. 18th, Calumet and Kalamazoo, Mich.; Dover, N. J.; Wauseon, Ohio. 19th, Mauzy, Ind.; Egg Harbor City, N. J. 20th, Fort Sully, Dak.; Logansport, Ind.; Wauseon, Ohio; Rappahannock, Va.; Columbia, S. C. 21st, Manatee and Cedar Keys, Fla.; Crete, Nebr.; Yaquina Lighthouse, Oregon; Wytheville, Va.; Vashon, Wash. 22d, Rappahannock, Va. 23d, Webster, Dak.; Titusville, Fla. 25th, Butlerville, Ind. 26th, Marquette, Nebr.; Rappahannock, Va. 28th, Trenton, Tenn. 30th, Fort Sully, Dak.

#### MIGRATION OF BIRDS.

*Geese flying southward.*—Nicolaus, Cal., 9th, 12th, 17th;

Sacramento, Cal., 15th, 30th; San Diego, Cal., 19th; Fort Buford, Dak., 21st; Salina, Kans., 13th; Grand Haven, Mich., 2d, 9th; Poplar River, Mont., 25th, 28th; Crete, Nebr., 21st; Albany, Oregon, 6th, 10th, 22d; Linkville, Oregon, 11th, 16th, 28th; Wellsborough, Pa., 25th, 26th; Fort Canby, Wash., 4th, 28th; Pysht, Wash., 15th; Port Angeles, Wash., 28th.

*Geese flying northward.*—Fort Sully, Dak., 24th; Linkville, Oregon, 26th.

*Geese flying eastward.*—Little Rock, Ark., 23d.

*Ducks flying southward.*—Little Rock, Ark., 23d; Erie, Pa., 16th; Tatoosh Island, Wash., 2d.

*Brants flying southward.*—Independence, Kans., 27th.

*Cranes flying southward.*—Independence, Kans., 27th.

#### SAND STORMS.

Yuma, Ariz.: a heavy sand storm prevailed from 1.50 to 3.25 p. m. on the 19th; maximum velocity of the wind during the storm, thirty-eight miles per hour.

A sand storm is also reported to have occurred at Fresno, Cal., on the 5th.

#### SUN SPOTS.

Mr. H. D. Gowey, of North Lewisburg, Champaign Co., Ohio, reports having observed sun spots on the following dates: 3d, 4th, 14th to 21st.

### VERIFICATIONS.

In consequence of the urgency of other work the detailed comparison of the tri-daily indications for September, 1887, and the average percentages of verifications, have not been completed in time for publication in this REVIEW. The usual data in connection will, however, appear in the succeeding number, as it is not considered advisable to delay the current issue.

#### LOCAL VERIFICATIONS.

The following is from the report of the "Michigan State Weather Service" for September, 1887:

Weather and temperature signals are now displayed in one hundred and forty-three towns in the state, and on the baggage-cars of twenty-five trains on seven principal railroads of the state.

The percentage of verification of weather signals for September is as follows: (the verification is taken from reports of displaymen furnished this office monthly) temperature, 82.8 per cent.; weather, 86.5 per cent.; temperature and weather, 84.7 per cent.

The percentage of verification of weather predictions for September on the D., G. H., and M. R'y., is 84.2 for weather and 80.8 for temperature; on the C. & G. T. R'y., weather, 85.3, and temperature, 83.5; P. H. & N. R'y., weather, 88.6, and temperature, 81.5; M. C. R'y., for weather, 84.0, and for temperature, 82.8; G. R. & I. R'y., weather, 80.7, and temperature, 79.5; C. & W. M. R'y., weather, 85.0, and temperature, 83.3.

The following is from the September, 1887, report of the "Minnesota Weather Service:"

Verifications of weather signals for Minnesota were 80 per cent. for weather and 78 per cent. for temperature.

The following is from the September, 1887, report of the "North Carolina Weather Service:"

The percentage of verifications as determined from seven points in the state is as follows: weather, 80.1 per cent.; temperature, 78.2 per cent.

The following is from the September, 1887, report of the "South Carolina Weather Service:"

The percentage of verification of the weather and temperature predictions for the whole state was: for weather, 82.9 per cent.; for temperature, 80.8 per cent.

The following is from the "Tennessee State Board of Health Bulletin" for September, 1887:

The percentage of verification of weather and temperature predictions, furnished daily from the Signal Office at Washington to the various stations in the state during the month, was for the state: weather, 79.1 per cent.; and temperature, 88.2 per cent.

#### ERRATUM.

July, 1887, REVIEW, page 185, first column, make "Barbadoes, on the 20th, moving east. It then moved eastward," etc., read, "Barbadoes on the 20th, moving west. It then moved westward," etc.

### STATE WEATHER SERVICES.

The following extracts are republished from reports for September, 1887, of the directors of the various state weather services:

The "Alabama Weather Service," P. H. Mell, jr., of the Agricultural and Mechanical College, Auburn, director:

The month of September was singular, both on account of the continued drought over the first two-thirds of the period, and the high range of temperature at all stations during a greater part of the first half of the month. In north Alabama the thermometer reached as high as 104°, and before the close of the month there was a depression of more than 50°; but this cold wave did not strike the state until the last two or three days of the month. The heavy rain of the 16th and 17th that passed over the entire state, accompanied in many sections by violent electric displays, did much damage to both life and property. This storm was evidently the result of the passage of the low pressure across the northern part of the United States. In some sections of Alabama strong winds prevailed, coming from the southwest.

Crops of all kinds have suffered more or less on account of the dry, hot weather that extended over the greater part of the month. And the season

was very favorable for the multiplication of many injurious insects. The "Aletia" did great damage to the cotton plant, reducing the yield of staple, in some sections, to quite a low figure. One advantage of the warm dry season was the rapid opening of the cotton; and the farmers were able to pick it out rapidly on account of the many fair days without rain.

#### Summary.

*Temperature (degrees Fahr.).*—Monthly mean, 73° 8'; highest monthly mean, 78° 6', at Fayette; lowest monthly mean, 66° 5', at Opelika; maximum, 104°, at Fayette, on the 11th and 12th; minimum, 39°, at Evergreen, on the 26th; range for state, 65°; greatest local monthly range, 60°, at Evergreen; least local monthly range, 30°, at Union Springs; greatest daily range, 83°, at Tusculumbia on the 9th; least daily range, 0°, at Bermuda on the 19th.

*Precipitation, including melted snow (in inches).*—Average for the state, 8.51; greatest, 7.16, at Auburn; least, 1.28, at Pine Apple.

*Winds.*—Prevailing direction, southwest and southeast.

### The "Monthly Review of the Illinois Weather Service," Col. Charles F. Mills, director:

The meteorological features of September, 1887, were varied and noteworthy.

The areas of high and low pressure affecting Illinois to any great degree during the month were as follows: On the 20th a "high" of 30.2 formed in the Northwest Territories; with a steadily increasing pressure it moved south-eastward, covering Illinois on a. m. of 24th, and causing the low temperature and killing frost of that date.

On the 26th a "low" was observed central in southern Texas, that moved northeast to Louisiana on the 27th, north to western Tennessee on the 28th, and northwest to central Missouri on the 29th. This "low" was hemmed in by a "high" on the east and a "high" on the west, and after partly filling up, decreasing in energy, found its way out over Lake Michigan on October 1st. This "low" was the cause of the steady rainfall in the state from the 26th to 30th.

The average temperature of the first half of the month was considerably above the normal for that period; and the average for the remainder of the month was considerably below the normal for those dates. The highest daily mean temperature for the state was 82°, on the 6th, and the lowest, 51°, on the 28d. The prevailing dates of the maximum temperatures reported were the 6th, 9th, and 12th, and of the minimum temperatures, on the 24th, with but few exceptions. On the latter date, the first killing frost of the season was reported from all sections of the state, except the extreme southern portion from whence light frost was reported. Ice 1-6 inch thick formed in water troughs on same date at several of the stations reporting.

Local showers were frequent in the northern counties from 1st to 5th, but not a sprinkle of rain fell from the 18th to 20th. In the central and southern divisions, the total rainfall from the 1st to 25th would not average one-third of the amount that fell from the 26th to 30th. Of the fifty-eight stations from which rainfall was reported, five report over five inches, twenty-three from three to five inches, and the remainder from one to three inches.

The average rainfall for Illinois for September, 1887, 3.23, was but 0.06 below the September normal of past ten years. The greatest September average during this period, 5.29, fell in 1885, and the least, 1.16, in 1883. From two-thirds to three-fourths of the total rainfall for the past month fell from the 26th to 30th. The average rainfall for the northern division, 3.36, was 0.15 above the September normal of that section for the past ten years; for the central division, 3.68, was 0.39 above, and for the southern, 2.66, was 0.63 below. The greatest total monthly rainfall reported was 6.25 from Ashland, Cass Co., and the least, 1.01, from Pontiac, Livingston Co. The heaviest daily rainfall reported was 3.71 from Golconda, Pope Co., on the 22d.

#### Summary.

**Temperature (in degrees Fahr.).**—Monthly mean, 66°.5; highest monthly mean, 78°.9, at Mount City; lowest monthly mean, 58°.0, at Woodstock; maximum, 102°, at Griggsville on the 8th, Louisiana, Mo., on the 9th, and McLeansborough on the 12th; minimum, 28°, at Pontiac and Woodstock, on the 24th; range for state, 74°; greatest local monthly range, 73°, at Louisiana, Mo.; least local monthly range, 44°, at Oquawka; mean daily range for the state, 20°.5.

Prevailing direction of the wind, east.

### The "Indiana Weather Service," Prof. H. A. Huston, of Purdue University, Lafayette, director:

#### Summary.

**Atmospheric pressure (in inches).**—Monthly mean, 30.108; maximum observed, 30.468, at Lafayette, on the 16th; minimum observed, 26.688, at Mount Vernon, on the 27th; range for state, .775; greatest local range, .686, at Lafayette; least local range, .540, at Vevay.

**Temperature (in degrees Fahr.).**—Monthly mean, 66.4; highest monthly mean, 71.6, at Mount Vernon; lowest monthly mean, 62.8, at Columbia City; maximum, 97, at Mount Vernon, on the 12th; minimum, 25, at Mauzy, on the 24th; range for state, 72; greatest local monthly range, 66, at Mauzy; least local monthly range, 48, at Salem.

**Precipitation, including melted snow (in inches).**—Average for the state, 2.28; greatest, 4.06, at Blue Lick; least, 0.51, at Vevay.

**Wind.**—Prevailing direction, southwest.

### The "Kansas Weather Service," Prof. J. T. Lovewell, Topeka, director:

Three "rainy spells" this month gave to Kansas from 1 to 2.50 inches more rain in the middle and eastern divisions than the September average, while it has been below the average for the month in the western division.

There has been little variation from the normal temperature, except in isolated localities.

The outlook for stock during the coming winter is now more encouraging. Light frost occurred on the 28th and 29th in the west and northwest, but no damage was reported.

### The "Michigan Crop Report" (the state weather service is in charge of N. B. Conger, Sergeant, Signal Corps, at Lansing):

The meteorological features of the state are based upon reports received from forty-three voluntary observers, and eight of the United States Signal Service, and reliable newspaper clippings.

The temperature is slightly below the normal, and also the average rainfall

of the state, while the rainfall of the central and southern sections shows an excess.

There have been several severe gales during the month, and one tornado in the southeast portion which did considerable damage.

The work of advancing the display of weather signals is progressing very favorably, and the farmers, generally, express satisfaction for the benefits derived from the display of weather indications on the railway trains.

The mean temperature for September, 58°.2, is 1°.6 below the normal for the state. The temperature is below the normal in the different sections from 1°.2 in the southern section; 3° in the central section; 2°.5 in the northern section; and 2°.3 in the Upper Peninsula. The highest mean daily temperature, 71°, occurred on the 5th and 6th, and the lowest, 44°, on the 28d. The minimum temperature, however, occurred on the morning of the 24th, when a killing frost was reported in all sections. The temperature reached the frost line on eighteen days, when light frosts were reported from the different sections of the state. The maximum temperature throughout the state occurred on the 5th, 6th, and 7th, with but few exceptions. The maximum temperature of the month was 94° on the 3d, at Valley Centre.

The average monthly precipitation for September, 3.12 inches, is 0.84 inch below the normal. The Upper Peninsula has a deficiency of 1.92 inches, northern section, 2.06 inches deficiency; while the central section shows an excess of 0.48 inch, and the southern section 1.18 inches excess. The greatest excess occurred in the southeastern part of the southern section.

General rains fell on the 1st, 2d, 5th, 6th, 9th, 12th, 21st, 22d, 29th, and 30th. The rainfall on the 5th and 6th, and on the 21st and 22d was heavy. The greatest amount recorded in any twenty-four hours is recorded at Jonesville on the 21st and 22d, amount being 2.64 inches. The time was from 7 p. m. of the 21st to 9 a. m. of the 22d.

The rainfall of the 6th was accompanied in many localities by heavy thunder, and by hail in Lenawee county. The size of the hail-stones being estimated to be as large as marbles, and some damage is reported on farms near Adrian.

Of the average annual rainfall there is a deficiency of about 6 inches from February to October, although the excess of the central and southern sections has decreased it slightly.

#### Summary.

**Temperature (in degrees Fahr.).**—Highest monthly mean, 69°.9, at Valley Centre; lowest monthly mean, 53°.4, at Calumet; minimum, 19°.5, at Ewart, on the 24th; range for state, 74°.5; greatest local monthly range, 66°, at Ewart; least local monthly range, 43°, at Charlevoix; greatest daily range, 50°, at Valley Centre, on the 2d; least daily range, 3°, at Hudson, on the 26th.

**Precipitation, including melted snow (in inches).**—Average for the state, 3.12; greatest, 6.66, at Adrian; least, 0.23, at Ewart.

**Wind.**—Prevailing direction, east.

### The "Minnesota Weather Service," Prof. Wm. W. Payne, Carleton College, Northfield, director:

The month was characterized in the southern portion of the state by a temperature below the normal and a slight excess of precipitation in some counties; in the northern portion the temperature was generally above normal and the precipitation deficient. Frosts were of frequent occurrence, but as all crops had been harvested no damage was done. Hail was reported to have fallen on three occasions during the prevalence of thunder-storms. Brilliant auroral displays were observed on several nights. The high winds which occurred throughout the state on a number of days retarded threshing to some extent and blew over hay and straw stacks. Owing to the dry weather in the northern counties stubble and grass frequently took fire from the sparks of passing engines and thus destroyed considerable wheat.

**Temperature.**—The average for the state is 57°.3; this is 0°.2 above that of the corresponding month of 1886 and 1°.4 below that of 1885. The temperature has been below normal for the month in the southern and eastern portions of the state and above in the Red River Valley and northwestern portion.

**Precipitation (in inches).**—The average for the state is 2.48; this is 1.57 below that which fell in the corresponding month of 1886 and 0.74 below that of 1885. The rainfall has been very unequally distributed; the southeastern counties generally had an excess while elsewhere there was a deficiency, which was most marked in the northern and northwestern counties.

**Winds.**—The prevailing direction was from the south.

### The "Mississippi Weather Service," Prof. R. B. Fulton, of the University of Mississippi, Oxford, director:

**Temperature (degrees Fahr.).**—Monthly mean, 76; highest monthly mean, 81, at West Point; lowest monthly mean, 73, at Holly Springs; maximum, 100, at Lake, on 8th; minimum, 44, at Hernando, on the 28th; range for state, 56; greatest local monthly range, 55, at Hernando; least local monthly range, 29, at Biloxi; greatest daily range, 33, at several points; least daily range, 6, at Lamar and Mobile.

**Precipitation, including melted snow (in inches).**—Average for the state, 3.17; greatest, 11.47, at Biloxi; least, 0.73, at Hernando.

### The "Missouri Weather Service," Prof. Francis E. Nipher, of Washington University, Saint Louis, director:

**Temperature (in degrees Fahr.).**—Monthly mean, 67.5; highest monthly mean, 72.8, at Pro Tem; lowest monthly mean, 62.2, at Ironton; maximum, 104, at Pro Tem, on the 10th; minimum, 28, at Ironton, on the 24th; range for state, 76.0; greatest local monthly range, 73.0, at Louisiana; least local monthly range, 47.9, at Saint Louis (central station).

*Precipitation, including melted snow (in inches).*—Average for the state, 3.59; greatest, 6.48, at Miami, Saline Co.; least, 1.10, at Ironton.

*Wind.*—Prevailing direction, south.

The "Nebraska Weather Service," Prof. Goodwin D. Swezey, of Doane College, Crete, director:

The month of September has not been marked by any striking peculiarity, although the late continuance of pleasant weather and delay of frosts have been noticeable and the heavy rains of certain localities have been unusual.

*Precipitation.*—While the mean rainfall of the southeastern portion of the state (for which section we have records reaching back several years) has been only a little above the normal, a large area in the central part of the state and thence northeastward, has received from five inches upwards, reaching in one locality the astonishing rainfall of twelve inches; the western portion of the state, on the contrary, has had very little, ranging down to less than an inch in the extreme west. The extremes, therefore, have been unusual.

*Temperature.*—The mean temperature has been almost exactly normal, the extremes not great, and the absence of frosts quite marked. This latter is partly due to the temperature having hardly fallen to the freezing point anywhere, and to the prevalence of cloudy skies, and the number of cloudy days, averaging seven and a half, or nearly double the usual number for September.

The "New England Meteorological Society," Prof. Wm. H. Niles, of the Institute of Technology, Boston, Massachusetts, president:

Reports for the month were received from one hundred and thirty-seven observers.

*Atmospheric pressure (in inches).*—Monthly mean 30.07 (twenty stations); maximum observed, 30.47, at Albany, on the 17th, and Nashua, on the 18th; minimum observed, 29.37, at Eastport, on the 7th; range for New England, 1.10; greatest local range, 1.07, at Boston; least local range, 0.83, at Nantucket.

*Temperature (in degrees Fahr.).*—Monthly mean, 57.4 (one hundred and two stations); highest monthly mean, 66.5, at Block Island; lowest monthly mean, 50, at Chelsea; maximum, 86, at Shelburne, on 5th, and Olneyville, on 6th; minimum, 21, at Berlin Mills, on the 24th; range for New England, 65; greatest local monthly range, 60, at Berlin Mills; least local monthly range, 25, at Nantucket; greatest daily range, 47, at West Milan, on the 20th; least daily range, 2, at Newport, R. I., on 12th and 29th.

*Precipitation, including melted snow (in inches).*—Average for New England, 1.59 (one hundred and twenty-one stations); greatest, 4.43, at Uncasville; least, 0.28, at North Truro.

*Wind.*—Prevailing directions, southwest and west (eleven stations).

The "New Jersey Weather Service," Prof. George H. Cook, of the Agricultural College, New Brunswick, director:

*Temperature.*—Monthly mean, 61° 6'; highest monthly mean, 67° 1', at Ocean City; lowest monthly mean, 57° 8', at Locktown; maximum, 92° 0', at Oceanic, on the 4th; minimum, 30° 0', at Tenafly, on the 27th; range for state, 62° 0'; greatest local monthly range, 55° 0', at Tenafly; least local monthly range, 37° 9', at Atlantic City; greatest daily range, 41° 0', at Tenafly, on the 9th, 18th, 19th; least daily range, 1° 0', at Bordentown, on the 30th.

*Precipitation, including melted snow (in inches).*—Average for the state, 3.66; greatest, 6.25, at Rancocas; least, 1.62, at Gillette.

The "North Carolina Weather Service," Dr. Herbert Battle, of Raleigh, director:

*Temperature.*—Mean for September, 1887, 69° 3'; normal for September, 70° 0'; departures from the normal, —0° 7'; highest observed, 101° 0', occurred at Oxford, N. C., on the 14th; lowest observed, 33° 0', occurred at Marion, N. C., on the 25th. Range for the state, 66° 0'; mean daily range, 19° 3'; highest on record, 101° 0', occurred at Oxford, N. C., in 1887; lowest on record, 33° 0', occurred at Marion, N. C., in 1887. Warmest day, 14° 5' above the normal, on the 14th. Coldest day, 23° 3' below the normal.

*Precipitation.*—Average precipitation for September, 1887, 2.29 inches; normal for September, 4.33 inches; departure from the normal, 2.04 inches; greatest local daily rainfall, 2.80 inches, on the 28th, at Marion, N. C.; greatest monthly rainfall, 5.41 inches, at Marion, N. C.; least monthly rainfall, 0.43 inch, at Wilmington, N. C. Rainfalls exceeding one inch: Marion, N. C., 2.80 inches; Chattanooga, Tenn., 1.83 inches; Norfolk, Va., 1.78 inches; Lynchburg, Va., 1.84 inches; Reidsville, N. C., 1.50 inches; Raleigh, N. C., 1.18 inches; Weldon, N. C., 1.18 inches; Mount Pleasant, N. C., 1.03 inches.

*Relative Humidity.*—Mean for September, 1887, 74.2 per cent.; normal for September, 74.4 per cent.; departure from the normal, —0.2 per cent.

*Winds.*—Prevailing direction for September, 1887, southwest; average direction for September, northeast; highest velocity, thirty-two miles, from the northeast, on the 7th, at Knoxville, Tenn.

Average number of clear days, 11.0; average number of fair days, 13.1; average number of cloudy days, 5.9; average number of rainy days, 6.0.

The "Ohio Meteorological Bureau," Prof. B. F. Thomas, of the Ohio State University, Columbus, president:

A comparison of the month of September, 1887, with the previous Septembers shows that the mean barometric pressure for the month was the highest recorded since the state meteorological work commenced. The mean pressure, 30.09 inches, was .03 inch above the normal, and .02 inch higher than any previous September; the range of pressure during the month was .83.

The mean temperature, 63° 7', was 1° 1' below the average for the five years, and 2° 2' above the normal; highest temperature, 98°, on the 13th, at Georgetown; lowest temperature, 23°, on the 24th, at Paulding; the range of temperature was 75°, being the greatest range recorded; greatest daily range of temperature, 65°, on the 6th, at Paulding; least daily range of temperature, 2°, on the 11th and 16th, at Logan and Youngstown; the mean daily range, 22° 5', was only 0° 3' below the average.

The rainfall, 2.17 inches, was 0.79 inch below the average, and 0.55 below the normal, and was the lightest so far recorded. The greatest rainfall recorded was 3.78 inches at Cleveland (Hyde); the least, 1.12 inches at Napoleon.

Local rains occurred in the northern section on the 4th, 5th, 8th, and 9th. In the middle and southern sections on the 18th.

Warm and cool waves alternated over the state on the following dates: Warm waves—1st; 4th to 8th; 12th to 14th; 18th to 22d; 28th to end of the month. Cool waves—2d to 4th; 8th to 12th; 14th to 18th; 22d to 28th.

The cool wave from the 22d to 28th gave the lowest temperature so far recorded during September, the minimum noted being 23°, on the 24th, at Paulding; the warm wave lasting from the 12th to 14th gave the highest, 98°, on the 13th, at Georgetown. The different sections gave the following means: northern, 60° 9'; middle, 63° 9'; southern, 66° 2'.

Average number of clear days, 9.0; average number of fair days, 12.0; average number of cloudy days, 9.0; average number of days on which rain fell, 10.8; least number of days on which rain fell, 6, at New Bremen; greatest number of days on which rain fell, 18, at Akron; mean monthly rainfall, 2.17 inches; average daily rainfall, 0.72 inch.

Prevailing direction of wind, northeast.

"Oregon Weather Service," report prepared by B. S. Pague, Private, Signal Corps:

*Temperature.*—The mean temperature for the month was below the normal in the northern part of the Willamette Valley, in the Columbia River basin, from the Dalles to the sea, and along the immediate coast; it was above the normal from Albany southward in the interior valleys, and nearly normal in eastern Oregon. The greatest excess was at Fort Klamath, the greatest deficiency at Bandon, on Coos Bay. From the 1st to the 5th and from the 11th to the 23d the temperature was below the normal over the entire state; from the 19th to the 21st occurred the extreme lowest. On the 6th a warm wave passed over the state, the highest reported being 90°, at East Portland, again on the 27th another warm wave, the highest, 95° at Roseburg. The unusual warmth during the last six days of the month caused the temperature to rise from two to four degrees. The mean of the state was 57°; Roseburg and Ashland, the highest means, 61°, and Fort Klamath, in the southern mountain region, the lowest, 51°.

*Precipitation.*—The rain fell in showers, the greatest number, eleven, at Astoria, the least, two, at Lakeview. A heavy warm rain fell in the northern part of the state on the 30th, on October 1st in southern part. The greatest excess, at Portland; the greatest deficiency, at Bandon. There has been no marked general rain storm to indicate the commencement of the "rainy season." For the season from July 1st the rainfall is generally below the average.

*Weather.*—Smoke was occasionally observed; however, it was generally clear, about twenty days of "Indian summer," very cool nights and warm afternoons.

*Winds.*—The winds were northerly in the Willamette Valley, southwesterly along the coast, and westerly in the other sections of the state.

The "Pennsylvania State Weather Service," prepared under direction of the Franklin Institute, Philadelphia, Sergeant T. F. Townsend, Signal Corps, assistant:

The weather for September in Pennsylvania has been slightly colder than the average, and has ranged from nearly normal in the western portion to about 3° below in the eastern portion. The mean temperature for the state was 60°. This, as compared with last September, is between 4° and 5° lower. About the usual differences have occurred between the tide-water sections and the elevated districts.

Rather more than the average amount of cloudiness prevailed.

The rainfall has averaged about three inches as a whole. The greatest rainfall reported was at West Chester, and amounted to 5.67 inches. The heaviest rains occurred on the 11th and 12th, and were quite general throughout the state. Heavy rains were also reported on the 28th and 29th in the eastern counties.

The month has been less stormy than usual, with a small proportion only of windy days. There has been no severe general storm attended with great changes of pressure and profuse rainfall in the eastern counties, as often occurs in September.

The barometer has ranged high, and the monthly mean is above the normal; the mean at Philadelphia being 30.11, Pittsburg, 30.08, and Erie, 30.10.

While light frosts were reported on low lands during the first and middle of the month, vegetation was vigorous and generally uninterrupted until it was suspended by the cold and frost of the 25th and 26th. At this time corn was everywhere fairly ripened, but tobacco, huckwheat, and some vegetables were still growing. These frosts were anticipated by the Chief Signal Officer, and warnings were sent to the tobacco districts.

The wheat seeding season has been favorable, the ground in good condition, and the crop at this date fairly started. The late crop of hay is generally good in the eastern counties. The fruit crops of the state are gathered so

early that they are not subject to risk from frost, except in a few northern districts.

The "South Carolina Weather Service," Hon. A. P. Butler, Commissioner of Agriculture for South Carolina, director:

The prominent meteorological features of the month were the deficiency of the rainfall and the unusually early occurrence of frost.

In regard to the first, the deficiency of rainfall, it may be stated that no rain fell in this state during the period from August 28th to October 15th, and then the showers were light and very badly distributed. At many stations rain fell on only one or two days during the month. The rains of the 23d, 28th, and 29th were quite general, and, though light, they greatly benefited suffering vegetation. At Charleston the rainfall for September, 1887, 1.31 inches, was 4.65 inches less than the average of the last sixteen years, and was the lowest September rainfall recorded since the establishment of the United States signal station in 1871.

The mean temperature for the state was below the average: At Charleston it was 74°.0, against 76°.1, the average for September during the last sixteen years.

The frost which occurred on the 25th, and which was general in the middle and upper divisions of the state, merits special mention, ranking, as it does, with the earliest frost on record in this state. The frost was light, and, owing to the extreme dryness of the atmosphere, no damage, other than the blighting of delicate garden plants, was done to vegetation.

Probably the earliest frost on record in this state was that recorded by Dr. W. W. Anderson, at Stateburg. In examining the records kept by that gentleman, and kindly placed at our disposal, we find that frost occurred on September 24th and 25th in the year 1856, the temperature at sunrise on the first date being 42°, and on the second 46°. The record states that light frost was observed on both dates. From a record kept by Governor J. H. Hammond, at a plantation near Silver Bluff, S. C., and covering a period of thirty-three years, 1852 to 1864 (See Hand Book of South Carolina), we find the earliest frost recorded October 8th, 1852.

#### Summary.

*Temperature (degrees Fahr.).*—Monthly mean, 72°.2; highest monthly mean, 75°.1, at Belfast; lowest monthly mean, 67°.8, at Kirkwood; maximum, 101°, at Chester, on 15th; minimum, 34°, at Kingstree, on the 25th; range for state, 67°; greatest local monthly range, 61°, at Chester and Kingstree; least local monthly range, 41°, at Charleston; greatest daily range, 44°, at Jacksonborough, on the 7th; least daily range, 6°, on the 27th, at Batesburg.

*Precipitation, including melted snow (in inches).*—Average for the state, 1.12; greatest, 2.69, at Marion; least, 0.12, at Allendale. Average number of rainy days, 3.9.

*Wind.*—Prevailing direction, east.

The following is an extract from the report of the "Meteorological Department of the State (Tennessee) Board of Health," prepared under direction of J. D. Plunkett, M. D., President

of the State Board of Health, by H. C. Bate, Signal Corps, Assistant, Nashville:

The month of September was devoid of any special meteorological features, excepting, perhaps, the abnormally high temperature about the 10-14th. There were but few electrical disturbances, and no very high winds.

The mean temperature was 70°.5, about the September mean of the past five years. The highest temperature was 102°, recorded on the 12th, and was several degrees above the highest recorded in September during the five years past. A maximum of 100° was recorded at several stations during the period of the hot wave which existed during the second decade of the month. The lowest temperature was 34°, recorded on the 25th at two stations, and was below the average September minimum. This cold wave was felt at all the stations on the 24th and 25th, and was followed by the rains of the 26-28th. The highest monthly mean was 77°.4, reported at Austin, and the lowest was 64°.7, reported at Fostoria.

The mean precipitation was 2.70 inches, very nearly the September average of the past five years. Of the amount the eastern division received an average of nearly two and a half inches, the middle division about three inches, and the western division two and a half inches. Until the 17th very little fell in the state, and the proportion of sunshine being very largely above the average, in addition to the high temperature, caused one of the severest droughts known in the history of the state. The rain of the 17-18th was pretty well distributed, and was very welcome, but it was not until the rains of the 26-28th that any material benefit was felt. These rains were, at most points, copious and reviving. The greatest monthly rainfall was 6.84 inches, at Nashville, and was the greatest September rainfall reported at this station during the seventeen years of its establishment, the next greatest being 6.49 inches, in 1881. The least monthly rainfall was 1.34 inches, reported at Greeneville. This was the greatest September minimum during the past five years. The greatest local daily rainfall was 4.00 inches, reported at Fostoria, on the 27th. The next greatest daily fall was 3.12 inches, on the 18th, at Nashville. The rain of the 27th was the heaviest during the month. This was followed by a heavy fall the next day. There were eleven days on which no measurable rainfall was reported. There was very little electrical disturbance with any of the rains during the month.

#### Summary.

Range of temperature, 68°; mean monthly range of temperature, 58°.7; greatest monthly range of temperature, 64°, at Hohenwald; least monthly range of temperature, 44°, at Careyville and Covington; mean daily range of temperature, 20°; greatest daily range of temperature, 43°, on the 9th, at Riddleton and Lawrenceburg; least daily range of temperature, 2°, on the 17th, at Riddleton, and on the 18th, at Florence Station.

Average number of clear days, 14; average number of fair days, 9; average number of cloudy days, 7; average number of days on which rain fell, 7.

Mean daily rainfall, 0.09 inch; days of greatest daily rainfall, 17th, 18th, 22d, 27th, 28th; day of greatest rainfall, 27th; days without measurable precipitation, 1st, 2d, 5th, 6th, 9th, 13th, 14th, 20th, 21st, 24th, 30th.

Warmest days, 12th, 14th; coldest days, 24th, 25th.

Prevailing winds, east and southeast.